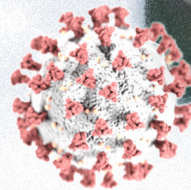# Translating Wastewater Data for Policymaking

Aparna Keshaviah, Sc.M.

Senior Statistician, Mathematica
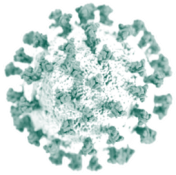
akeshaviah@mathematica-mpr.com
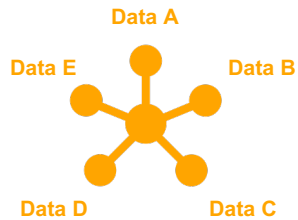
SARS-CoV-2

Overview of presentation
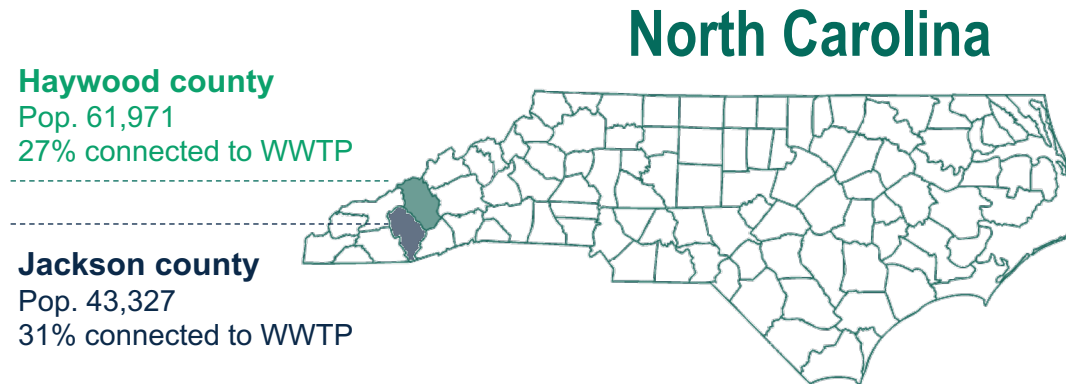
Impact of standardization on wastewater trends and alerts

Data A
Data E
Data B
Data D
Data C

Contextualizing wastewater data for policymakers

Triangulating information through data synthesis

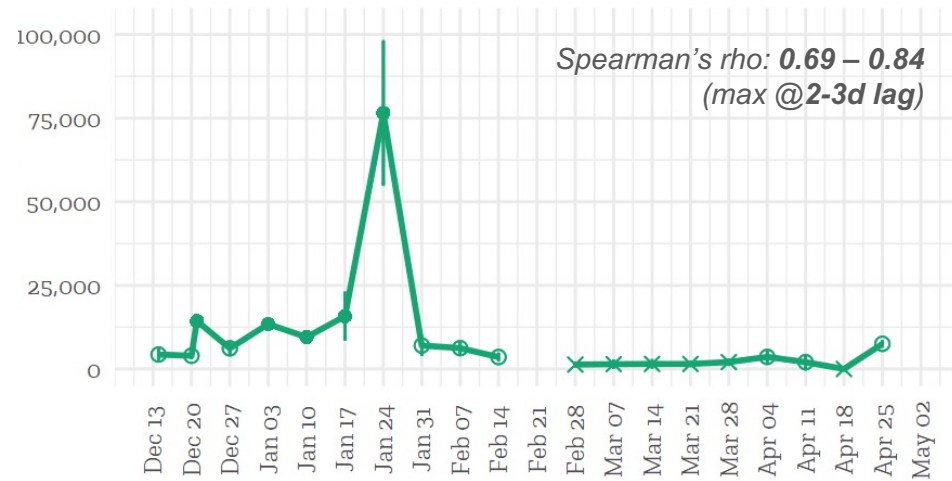Mathematica

Impact of standardization on wastewater trends and alerts

North Carolina

Haywood county
Pop. 61,971
27% connected to WWTP

Jackson county
Pop. 43,327
31% connected to WWTP

Influence of different parameters on trends

Haywood county

(A) *Unstandardized* viral concentration

Spearman's rho: **0.69 – 0.84**
(max @**2-3d lag**)

(B) Standardization by flow rate, service population, & viral recovery (BCov)

Spearman's rho: **0.72 – 0.87**
(max @**7-8d lag**)

(C) Standardization by a human biomarker (PMMoV)

Spearman's rho: **0.68 – 0.86**
(max @**1-2d lag**)

Mathematica

Influence of different parameters on trends

(B) Standardization by flow rate, service population, & viral recovery (BCov)

*Spearman's rho: **0.75 – 0.83***
*(max @**0-4d lag**)*

Jackson county

(A) *Unstandardized* viral concentration

*Spearman's rho: **0.76 – 0.84***
*(max @**4d lag**)*

(C) Standardization by a human biomarker (PMMoV)

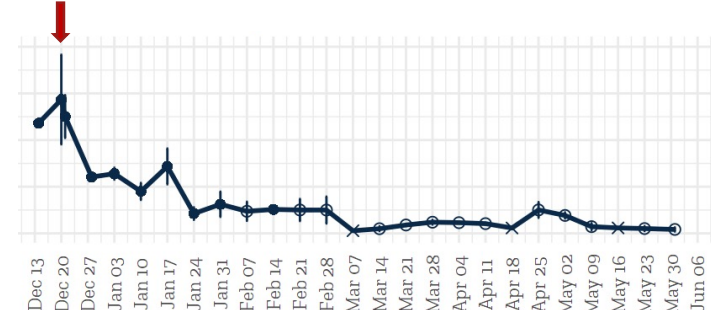*Spearman's rho: **0.73 – 0.84***
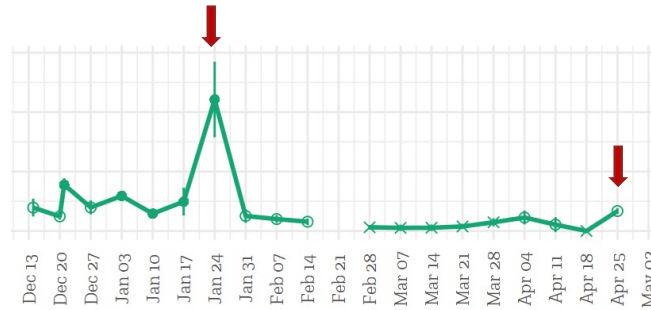*(max @**1-4d lag**)*

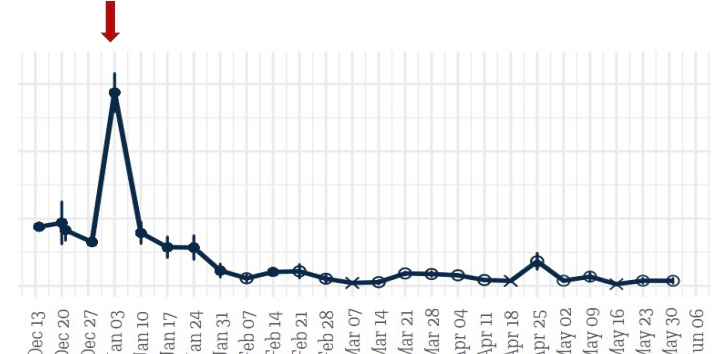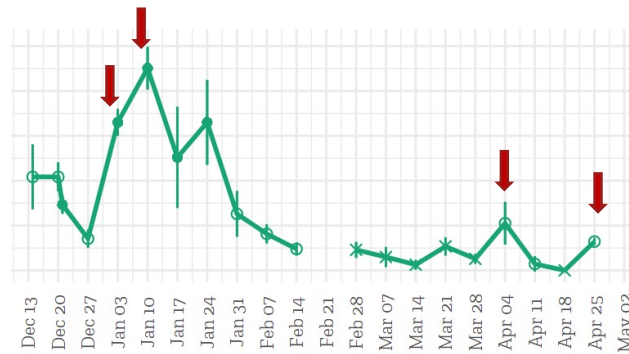Mathematica

What criteria should trigger an alert?

Haywood county

Jackson county
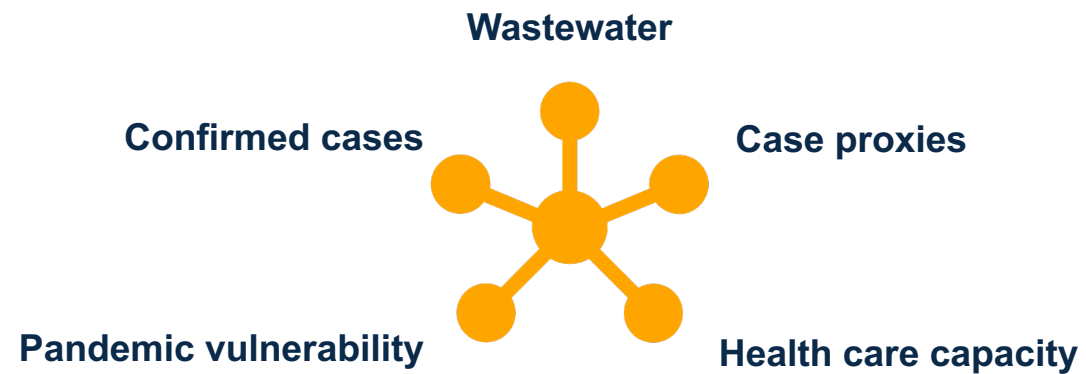
Standardized by flow, pop., BCov
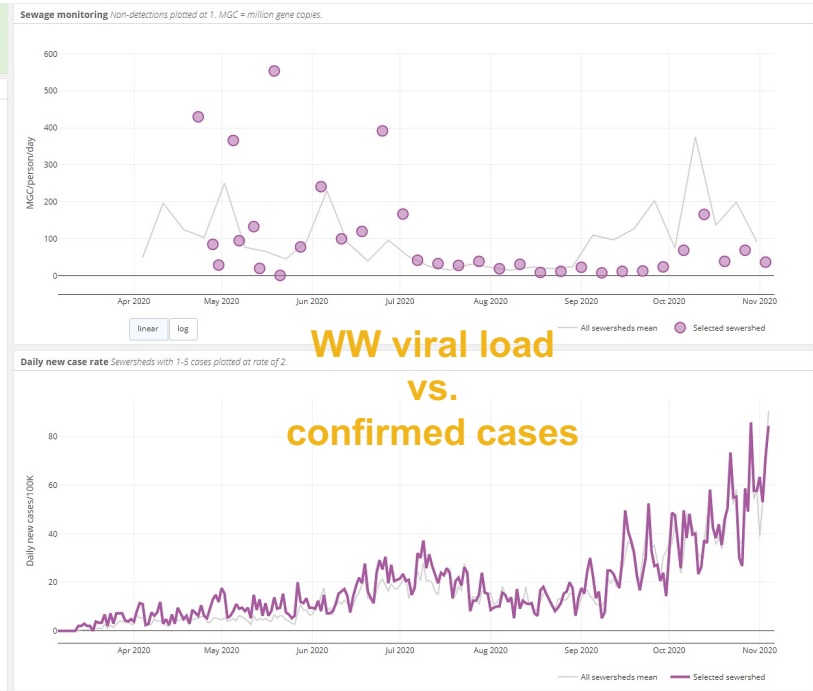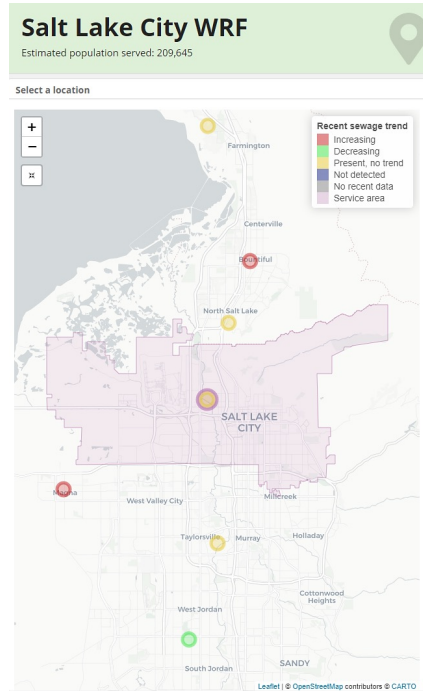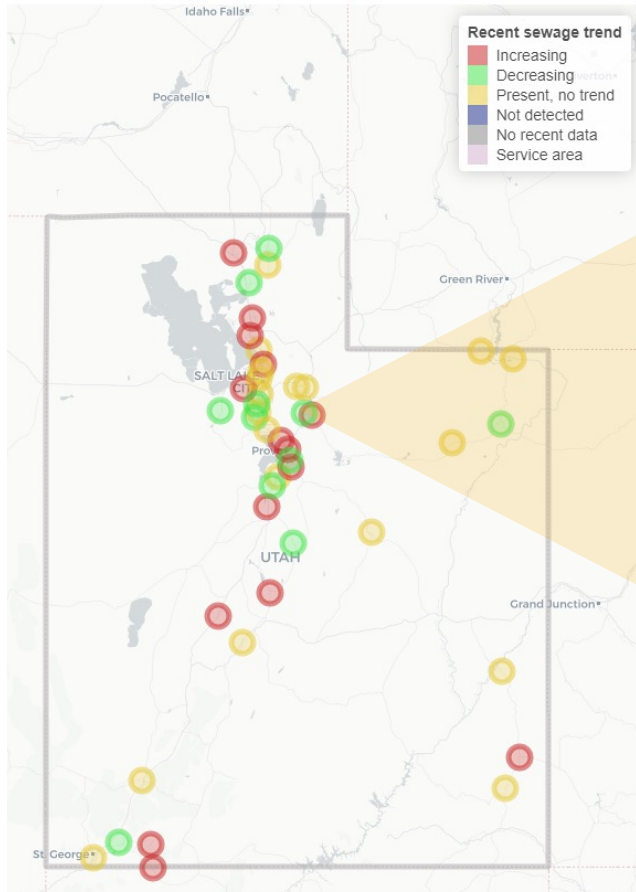

Standardized by PMMoV

Should alerts be based on:

- **Levels crossing a threshold?** *Based on absolute levels or percent change?*
- **Sustained increase for X days?** *How many days? Ignore large spikes?*
- **Statistically significant increase?** *What type I error rate is appropriate?*
- **Regression modeling of trends?** *Ability to handle non-linear effects?*

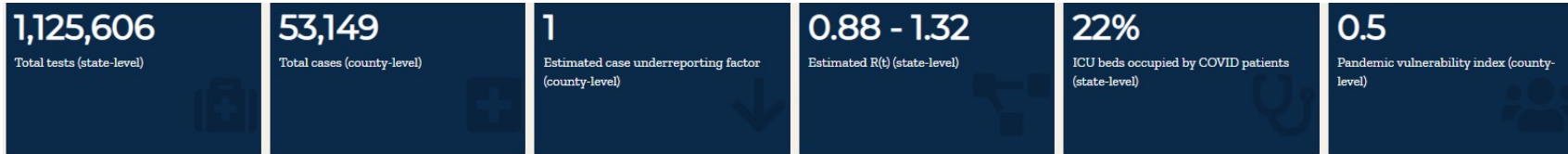# Contextualizing wastewater data for policymakers

Wastewater

Confirmed cases

Case proxies

Pandemic vulnerability

Health care capacity

Utah DEQ wastewater dashboard

Salt Lake City WRF
Estimated population served: 209,645

Recent sewage trend
- Increasing
- Decreasing
- Present, no trend
- Not detected
- No recent data
- Service area

Sewage monitoring *Non-detections plotted at 1. MGC = million gene copies.*

Daily new case rate *Sewersheds with 1-5 cases plotted at rate of 2.*

WW viral load
vs.
confirmed cases

Mathematica wastewater dashboard

Curated COVID-19 repository

https://www.mathematica.org/features/covid-19-curated-data-modeling-and-policy-resources
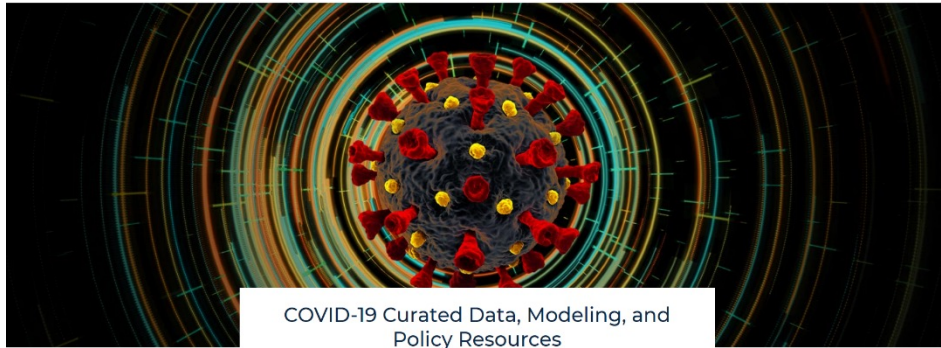
COVID-19 Curated Data, Modeling, and Policy Resources

Vaccination

Racial Disparities

Case Counts and Testing Rates

Surveillance Tools

Diagnostic Testing Methods and Coding

Contact Tracing

Provider Capacity and Patient Needs

Identifying At-Risk Populations

Secondary Impacts

Forecasting Tools

Policy Actions and Preventing Spread of the Virus
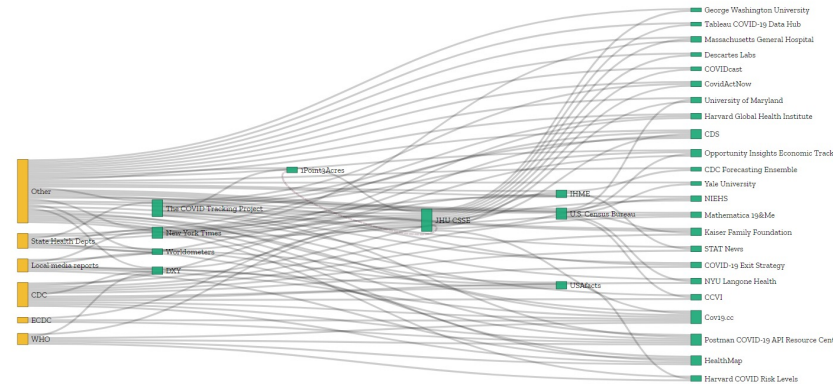
Other Resources

Vaccination

These sites provide detailed data, information, and resources related to vaccine development, vaccination rates, and vaccine acceptance.

US COVID Risk and Vaccine Tracker

SOURCE:
Covid Act Now

Go to resource

Covid Act Now (which joined forces with the Covid Exit Strategy and includes partners from Georgetown, Stanford, and Harvard) provides state and county-level data on COVID-19 cases, deaths, and hospitalizations, as well as test positivity, ICU occupancy and vaccination rates. Testing and ICU occupancy data come from the U.S. Department of Health and Human Services. The tracker aggregates these measures into an overall time-varying COVID risk indicator and a static measure of community vulnerability. The tracker offers email alerts for regions of interest as well as a weekly roundup of new research on COVID-19.

Triangulating information through data synthesis

Montana

Site Drug Use Profiles

Average Estimated Dose (mg/person)
- Anti-depressant
- Opioid
- Stimulant

Urban (0.36)
- #1 Codeine
- #2 Tramadol
- #3 Methamphetamines
- #4 Amphetamines

Rural (0.73)
- #1 Methamphetamines
- #2 Tramadol
- #3 Codeine
- #4 Amphetamines
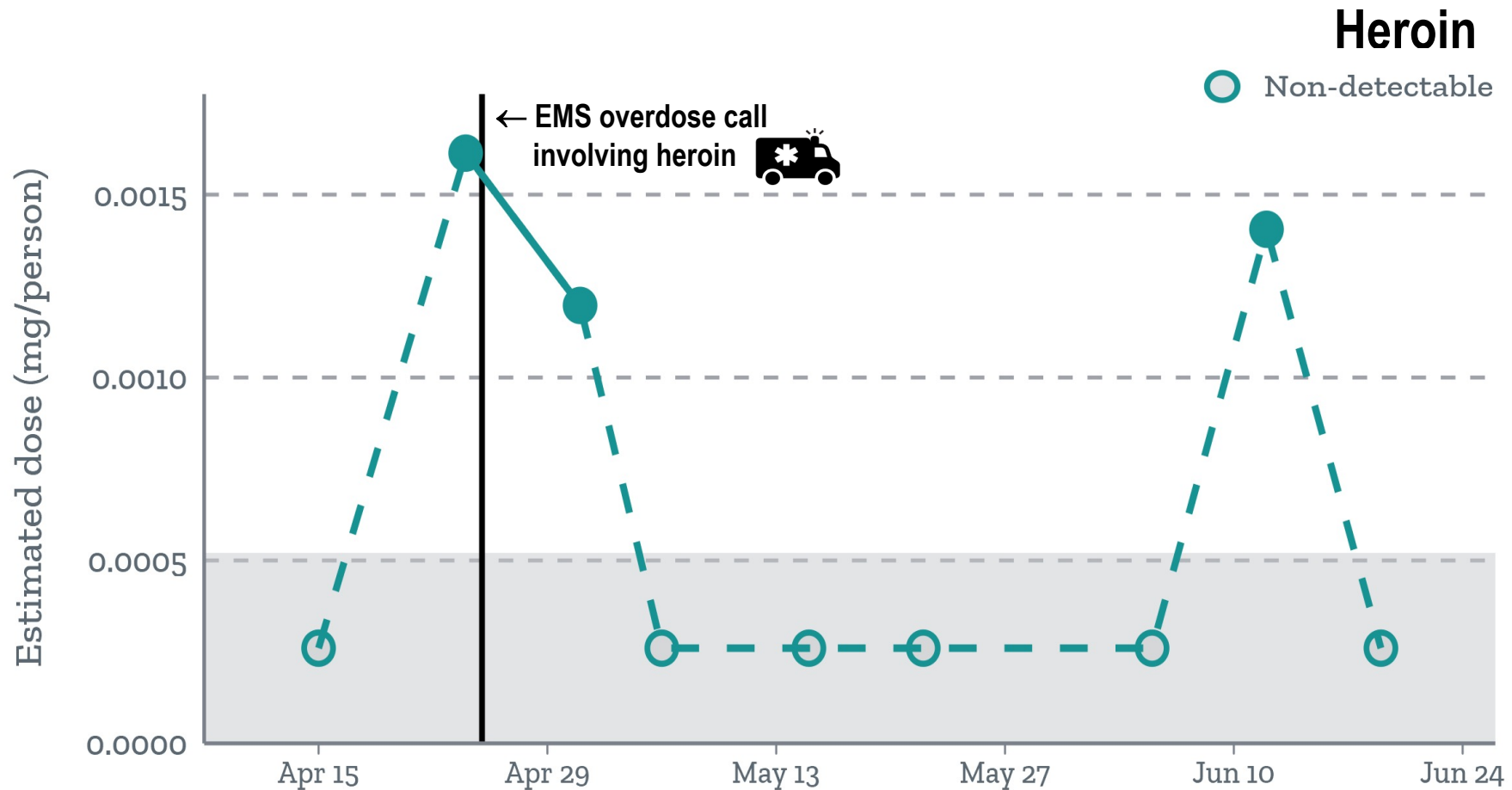
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12

Estimating Black Market Activity

Methamphetamines
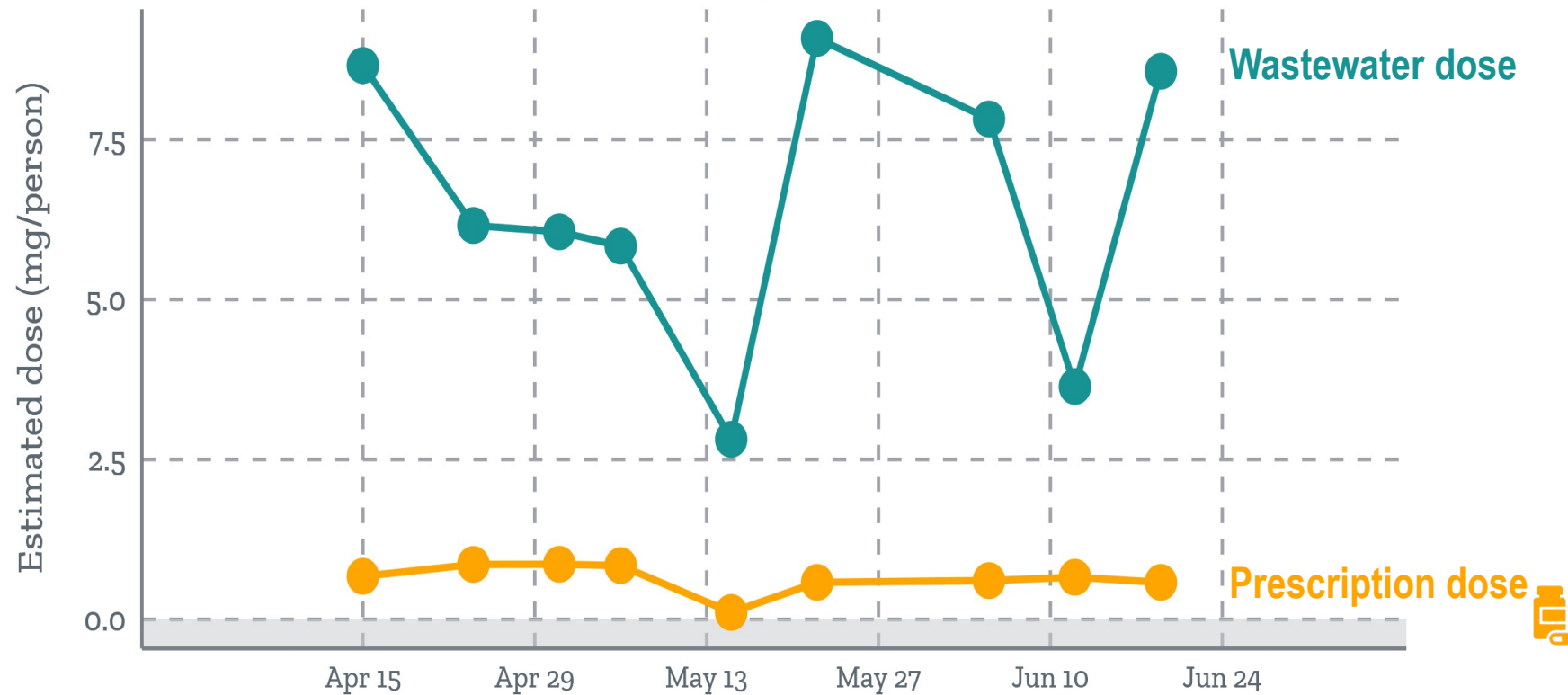
Predicting Need for Overdose Response

Measuring Law Enforcement Impact

← **Large seizure of meth / amphetamines**

Methamphetamines

Amphetamines

Estimated dose (mg/person)

Apr 15   Apr 29   May 13   May 27   Jun 10   Jun 24

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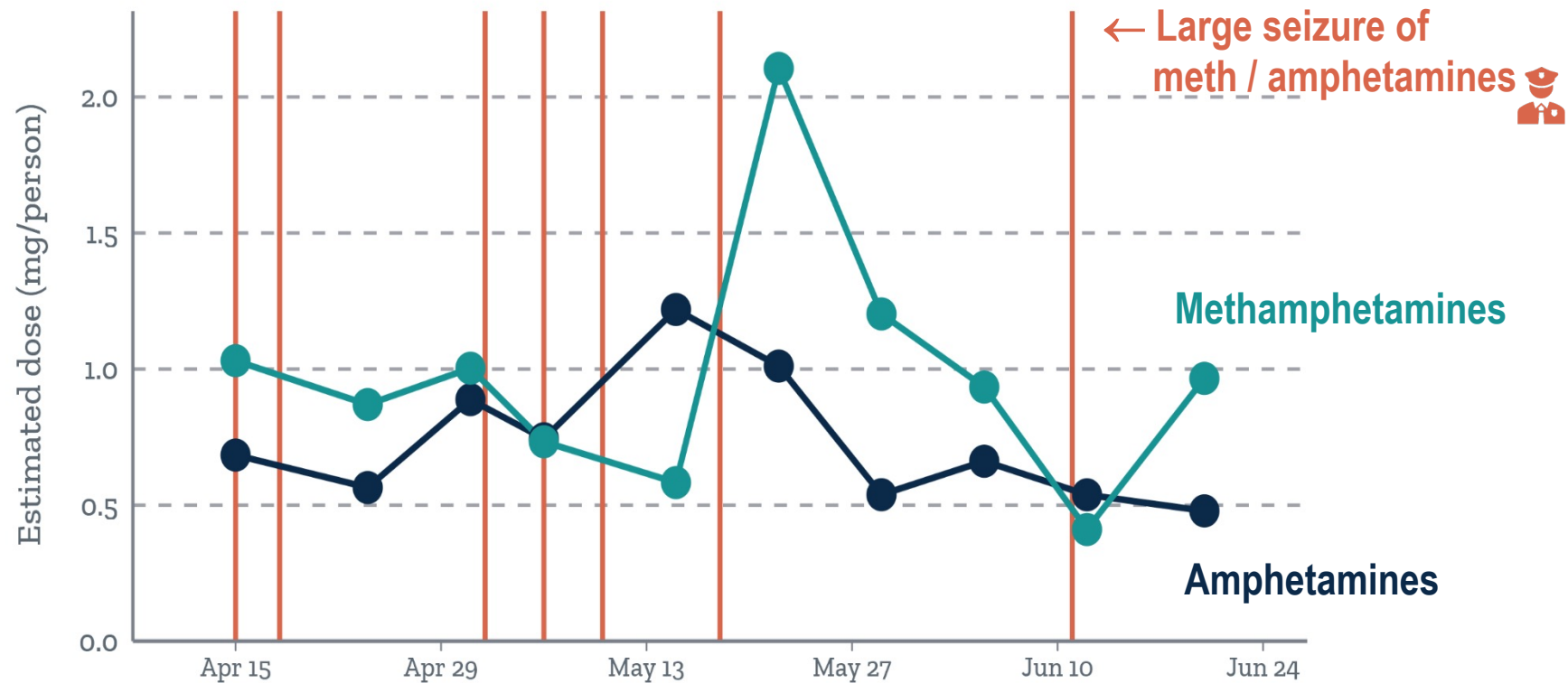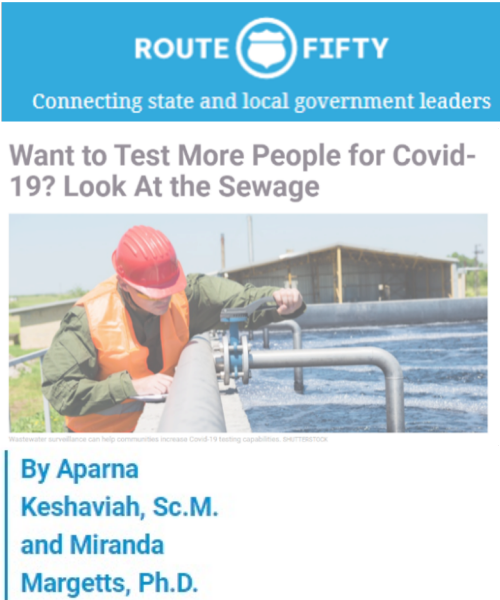
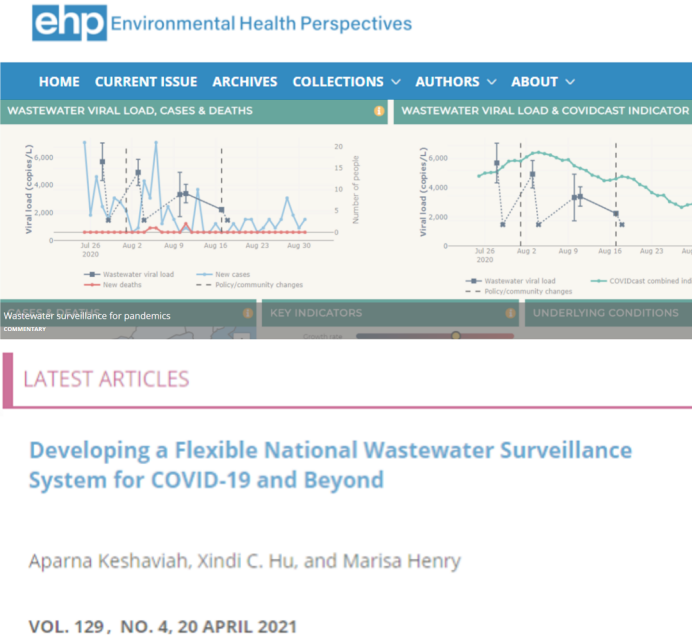# Some publications on our wastewater work

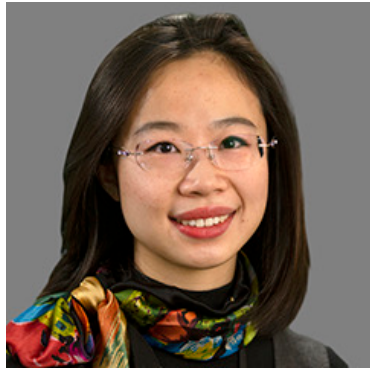**Call to action around the opioid epidemic**
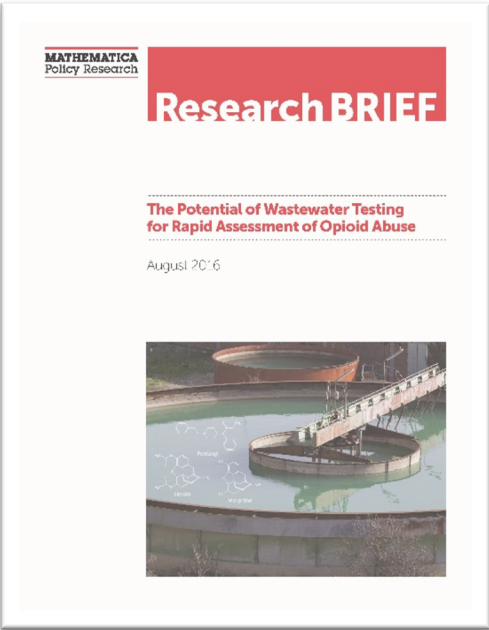
Taking lessons from the opioid epidemic for COVID-19

Developing a flexible national surveillance system

Acknowledgements

Xindi C. Hu
Senior Data Scientist
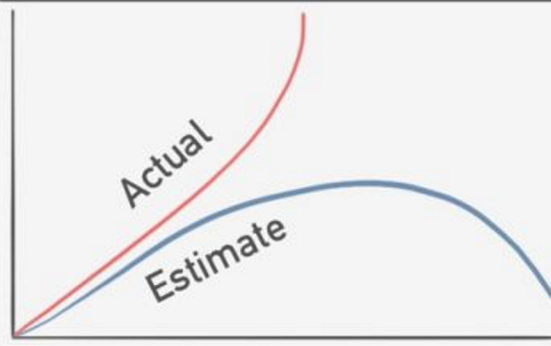

Marisa Henry
Data Analytics Developer

JACKSON COUNTY Department of Public Health

TUCKASEIGEE Water & Sewer Authority SERVING JACKSON COUNTY

UNIVERSITY of WISCONSIN UWMILWAUKEE

DOGWOOD HEALTH TRUST

MONTANA STATE UNIVERSITY

NIH National Institute of General Medical Sciences

U.S. DEPARTMENT OF HOMELAND SECURITY Homeland Security

NIST National Institute of Standards and Technology U.S. Department of Commerce

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Questions?